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| 10/608,946      | 06/26/2003  | Seong Kyun Kim       | 11037-128-999       | 6947             |

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| EXAMINER |
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ECHELMEYER, ALIX ELIZABETH

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| ART UNIT | PAPER NUMBER |
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1745

DATE MAILED: 03/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/608,946

Applicant(s)

KIM, SEONG KYUN

Examiner

Alix E. Echelmeyer

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Specification***

1. The disclosure is objected to because of the following informalities: the formula in paragraph [0025] shows that heat, or Q, is a product of the reaction, but in paragraph [0031], the same reaction in the reverse does not show heat, or Q, as a reactant.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 9, and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, in line 4 applicant claims "a reactor coupled to a reactor and the hydrogen storage unit..." The disclosure does not support either a reactor coupled to a reactor or a reactor coupled to the hydrogen storage unit. Based on the similar claim language in claim 5, examiner suggests that applicant meant to claim "a reactor coupled to the hydride storage unit."

Regarding claim 9, applicant claims a method of cooling a hydrogen fuel cell comprising exchanging heat with coolant to *raise* the temperature of the fuel cell stack,

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which is a method of heating the fuel cell (page 13 lines 10-11). Perhaps, applicant should claim a method of *controlling the temperature of* a hydrogen fuel cell stack.

Further, line 9 of page 13 (line 5 of claim 9) states that the method comprises “generating hydrogen at an elevated and oxide from an aqueous hydride.” Examiner suggests that applicant meant to claim “generating hydrogen at an elevated *temperature ...*”

As for claim 14, applicant claims “a first valve *between* disposed inline between ...” Examiner suggests that the first “between” should be omitted.

#### ***Allowable Subject Matter***

4. The following is a statement of reasons for the indication of allowable subject matter: the examiner believes the novelty of the invention to be the hydride regeneration cycle that involves providing pure hydrogen to a regenerator that is also provided with an oxide from a reactor within this regeneration loop. In the regenerator, the hydrogen and oxide are reacted catalytically to produce water and a hydride in the form of an aqueous hydride. That aqueous hydride then goes to a hydride storage tank, which can be accessed by the reactor. When the aqueous hydride goes to the reactor, it is reacted catalytically to produce an oxide, hydrogen gas, and heat. The oxide is then recycled back to the regenerator where it can be reacted with hydrogen from the hydrogen storage tank to produce more aqueous hydride. The hydrogen and heat that are produced by the reaction in the reactor are then used in the fuel cell stack. The heat is used in a heat exchanger to heat the fuel cell stack when a temperature sensor has

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determined that the heat exchange fluid is below a predetermined temperature. The hydrogen produced from the hydride in the reactor is used as a reactant in the fuel cell stack to produce electricity. When a temperature sensor determines that the fuel cell stack is operating above the predetermined temperature, the hydride regeneration cycle discussed above can be bypassed, and pure hydrogen from the hydrogen storage tank can be supplied directly to the fuel cell stack. A central processing unit, with the temperature sensor and three valves, such as solenoid valves, are used to control whether the hydrogen will travel through the hydride regeneration cycle and produce heat before being used in the fuel cell, or if it will travel directly to the fuel cell stack.

Essentially, the invention uses a reaction between a metal hydride and a catalyst within a reactor to produce hydrogen and heat for use in a fuel cell stack when the fuel cell stack is operating below a certain temperature. The hydride is produced by the reaction of an oxide, which is produced when the hydride is reacted, and pure hydrogen from a hydrogen storage tank already in the fuel cell system. The hydrogen in the hydrogen storage tank is also used to provide hydrogen directly to the fuel cell stack when heat is not needed in the fuel cell stack.

Kimbara et al. (US Patent 6,605,377 B1) teach a hydrogen supply tank that supplies hydrogen directly to a fuel cell. Kimbara et al. also teach a valve to control the flow of hydrogen from the storage tank to the fuel cell (Figure 1; column 6 lines 14-23).

Kimbara et al. fail to teach a hydride regeneration system using the hydrogen storage tank of Kimbara et al.

Regarding the hydride generation part of the instant application, Rusta-Sallehy et al. (US Patent 6,946,104 B2) teach a similar method of hydrogen generation. Rusta-Sallehy et al. teach a chemical hydride hydrogen generation system and an energy system incorporating it. The system comprises a storage tank for the chemical hydride solution, a supply line to provide the hydride to a reactor, a reactor containing a catalyst in which the hydride is reacted to produce hydrogen and an oxide selectively removes heat from the hydride generation system (column 2 lines 63-67; column 3 lines 42-47).

Rusta-Sallehy et al. fail to teach a hydride regeneration step using hydrogen from a hydrogen storage tank.

The examiner believes that Kimbara et al. and Rusta-Sallehy et al. both read on parts of the independent claims 1, 5, and 9. Yet, neither of these patents includes the hydride regeneration step that appears to be the novelty of applicant's invention. Also, there seems to be a lack of motivation to combine these patents to create the claimed invention.

5. Based on the above explanation, the examiner believes claims 1-14 to be allowable after the appropriate corrections discussed in paragraph 3 are made.

### ***Conclusion***

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kagatani (US Patent 5,900,330) and Dickman et al. (US Patent 6,465,118 B1).

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is 571-272-1101. The examiner can normally be reached on Mon-Fri 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
**PATRICK JOSEPH RYAN**  
**SUPERVISORY PATENT EXAMINER**

Alix Elizabeth Echelmeyer  
Examiner  
Art Unit 1745

aee